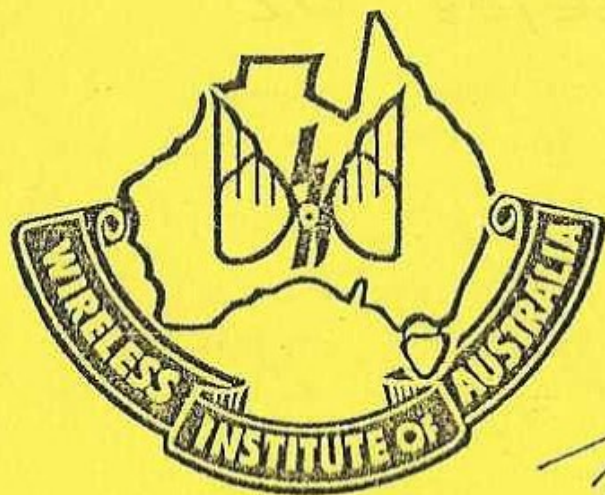


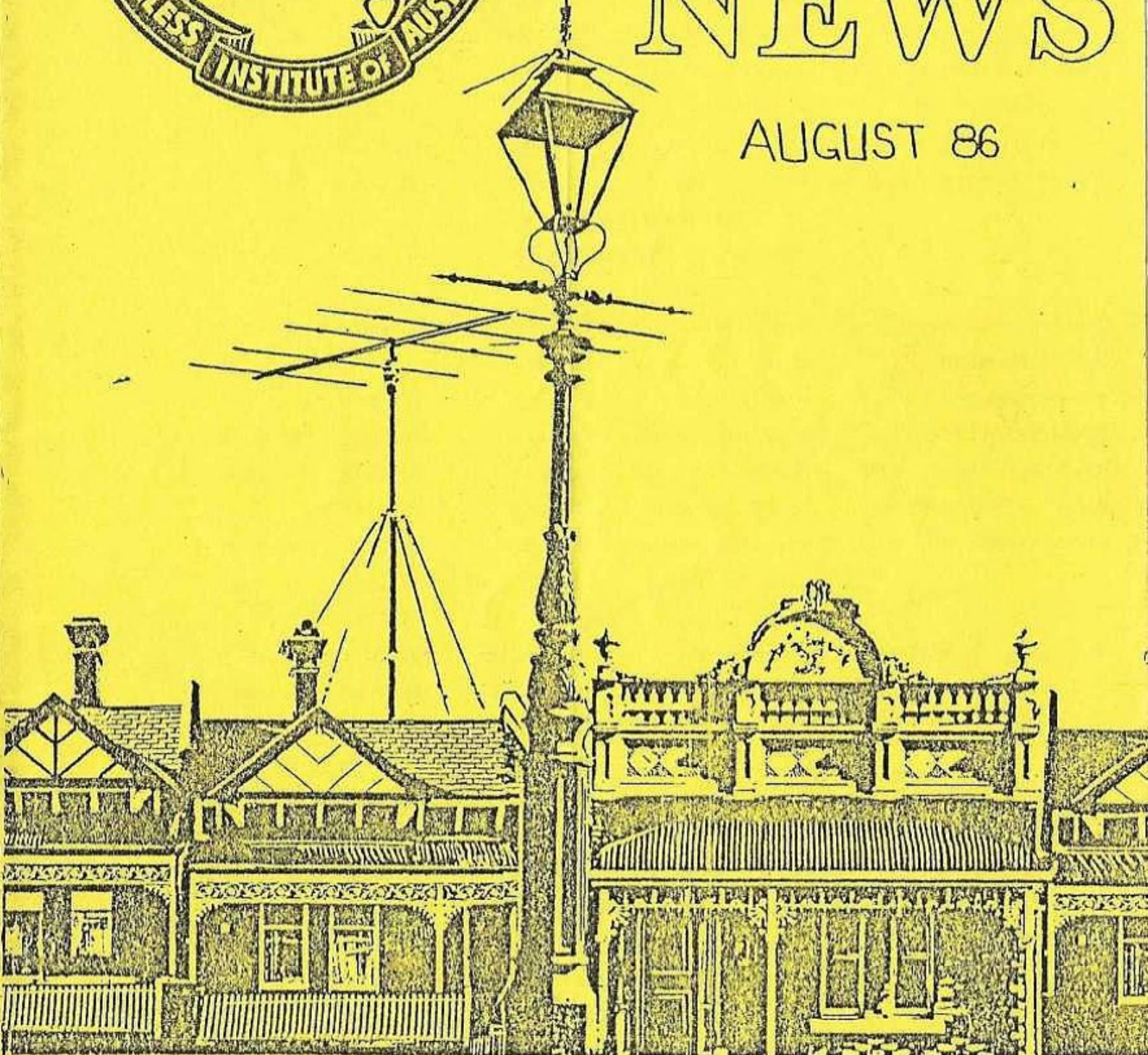
86/08

01



B·A·R·G NEWS

AUGUST 86



© Monthly Newsletter of the
Ballarat Amateur Radio Group

86/08 02

Executive Committee

			<u>Home</u>	<u>Business</u>
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Vice President	Lou Laquinto	VK3 DFI	49 2200	
Secretary	Jim Wright	VK3 CFB	32 7563	
Assistant Secretary	Dick Forrester	VK3 VU	35 7663	39 1001
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Education Officer	Ian McDonald	VK3 AXH	41 3717	31 1317
Net Co-ordinator	Fred Quick	VK3 KQF	32 3216	32 6455
Technical Officer	Ian Robinson	VK3 BTX	32 4139	
Member's Representative	Neil Davidson	VK3 KQO	35 9612	

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Awards Manager	Maurie Batt	VK3 XEX	42 2245	
Property Officer	Dick Antczewicz	VK3 AEX	32 3273	31 1818
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	Dick Forrester	VK3 VU	35 7663	39 1001
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	Maggi Laquinto	VK3 CFI	49 2200	
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	Phil Seddon	VK3 AQH	31 5220	31 3166
	Maurie Batt	VK3 XEX	42 2245	
	Dick Antczewicz	VK3 AEX	32 3273	31 1818

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B.A.R.G. meets on the LAST FRIDAY of every month at the Ballarat Education Centre, Hopetoun Street, Ballarat at 7.30 pm.

Committee meetings are held at the Education Centre on the Wednesday two weeks prior to the Club meeting, at 7.30 pm. Members of the Executive are expected to attend and any Club Member with business for discussion is welcome.

All correspondence should be addressed to -
The Secretary, B.A.R.G. Inc., PO BOX 216E, BALLARAT EAST. 3350.

86/08 03

MEETING OPENED at 8.00pm by President Bob with 27 members in attendance.

APOLOGIES. NLR, CUH, CWG, CFI, DFI, CAZ, NZL, PUD, NIZ, SE.

MINUTES of previous meeting as printed were confirmed. PAF/AAI.

CORRESPONDENCE IN Ballarat Scout Asscn. asking for assistance on JOTA weekend 18th and 19th October.

CORRESPONDENCE OUT Ansett, RNARS, Max & Evonne Wroe.

COMMITTEE MEETING. Secretary gave precis report on committee meeting for ratification by club members. AEX/DKJ.

TREASURERS REPORT. General a/c \$120.18. VS&L \$1712.10.
Accounts for N/L Postage \$13.00, N/L Printing \$35.20,
Corporate Affairs \$35.00, Room Hire \$60.00, Pies for
A.G.M. \$31.76. Passed for payment. AEX/KQF.

QSL MANAGER reported that no cards had been received from Bureau.

AWARDS MANAGER received applications for 2 G.R. 2 W.D. and 2 DX Widows.

CLUB NET Fred KQF reported that band conditions had been very bad and it was decided to start the Net at 8.00.

NEWS LETTER Contributions are still required, please keep them coming.

REPEATER Dick VU and Dick AEX attended the WIA VTAC meeting in Melbourne. Site approval has been received for our new repeater KBS at Smeeton and construction of the repeater is now completed. It is anticipated that this repeater will be operating before the summer fire season starts. Plans are now well in hand to start work on the UHF Repeater and applications have been made for a frequency and Callsign.

HAMVENTION Convener Murray AAI moved seconded by Fred KQF that a Hamvention Committee be formed. This motion was carried and a committee consisting of AAI, VU, DFI, KQQ, DIE, AEX, and WN was formed.

GENERAL BUSINESS.

Fred KQF asked that any member who could contribute 10 minutes or so would call into the net at 9.30pm to assist in giving stations trying to qualify for the Award the required numbers.

Leon NLR sent down samples of identification badges which are available at \$3.50 each.

Moved KQQ seconded DIE that Committee look into feasibility of presenting a badge to New and Upgraded members. Carried.

Neil KQQ is going to compile a photographic record of Club Members and their shacks, so don't be surprised if you receive a visit from Neil complete with camera.

The Club Christmas Dinner will be held on Friday 12th December. Further details on venue and cost later.

The Christmas B.B.Q. will be on Sunday 14th December.

IAN AXH then presented us with a most entertaining and informative talk on Power Line Interference supported by a display of D.O.C. equipment used in tracking down this problem. THANKS IAN.

The meeting closed with supper prepared by Bobs XYL Betty, thankyou Betty it was appreciated by us all.

73s Jim CFB.

NEXT CLUB MEETING 29th August, 7.30pm. Speaker Doug McLoed. (Mobile Antennas)

COMMITTEE MEETING 10th September, 7.30pm. Education Centre.

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86/08 04

LADIES COMMITTEE

On the 14th of August a meeting was held at the Pancake Kitchen. A pleasant evening was had by all.

PRESENT: Jan, Marg, Jane, Karen, Gwen and Pearl.

APOLIGIES: Betty.

AGENDA: COMING SOCIAL EVEN'G.

CONVENTION

NEW EXECUTIVE MEMBERS

The ladies decided to have a Casserole and Sweet Evening.

The rest of the Agenda will be discussed in length at the October Meeting.

SOCIAL EVENT.

CASSEROLE AND SWEET NIGHT

13th., September, 1986. (Saturday)

\$6.00 per family.

B.Y.O. Drinks.

6.30 p.m.

Dick & Fred Antosiewicz,

303 Talbot St.,

BALLARAT.

ALL WELCOME

I.

Ladies the next meeting will be held at Gwen Davidson's, 10 Rowlands St., Sebastopol. 8p.m.

Secretary: J. Forrester.

Karen YF/VK3AA1

Karen was hospitalised at the beginning of August in Melbourne for a cornea transplant. So far, some sight has been restored, and it will be a full year before she knows how successful the operation was. With an active 5 year old at home, convalescence won't be easy.

We wish you all the best, Karen. We all hope you have a speedy recovery.

de Maggie VK3CFI

86/08 05

PRESIDENT'S COMMENT

Well hopefully the winter will soon be behind us again. I guess all those ideas of new antennae and perhaps some portable operation are starting to emerge. The next six months will be a busy time for amateurs in general and our club in particular. Well who better to get you going than Doug McLeod with a very down to earth discussion on the ins and outs of mobile antennas. A message from Doug - "don't bring your cheque book, bring a pencil and paper, then build and test your own".

On the practical side of things, Ian AXH our educational officer is looking into some club projects. This subject has a lot of following in some of our bigger clubs. Details are being worked on and I think Ian is thinking of an all band field strength meter to start off. Any ideas have a chat to Ian and when the time comes have a go. Secretary Jim is always looking for news items for the club net, remember, Thursdays 9pm, 3610 KHZ is news time. Any items at all - coming events, WIA news, other club activities, wanted to buy swap etc - remember no discussion of prices please over the air (regulations). Our sick list at the moment includes Karen Felstead, Bud and Neville, to them all a speedy recovery and our thoughts. Thanks to Kevin 3WN who has jumped in to give Murray a hand with the convention. Murray has his hands full at the moment. As the convention approaches, we will be looking for more "willing" helpers, so let's know where you could be of assistance.

The new repeater nears completion and I understand will be tested for a while locally before installation on the final site on Smeaton Hill. Good on ya guys. I would like to think that members are wondering about how they can compete in the convention. Last year we didn't have too many locals in the starting blocks, so now is the time to check out your fox hunting, sniffing gear, scramble gear etc. Team up with someone and pool your resources and if you want a hand yell.

Thought for the month - "I think therefore I am". Well!

73's for now

Bob VK3BNC

Try the "TJ"

86/08 06

Whether TJ makes you think of Cameroon or Tokyo, Japan, the "DXpertise" of this antenna could help you snag the rare ones.

By R. R. Bohollenbach,* W1JF

City dwellers and small-lot owners frequently complain, "No room for a good DX antenna." Can you work DX on 160, 80 and 40 meters from that restricted bit of real estate? The answer is yes. Let me tell you about a compact antenna that is useful for working DX.

The TJ is a five-band, vertically polarized antenna system. In the 160-meter band the TJ is essentially a $1/4$ -wavelength (λ) T (see Fig. 1). It becomes a $1/2$ - λ T on 80 meters and a $5/8$ - λ T on 40 meters. For 20 and 15 the configuration becomes a $1/2$ - λ inverted J. It is from this combination of T and J that the antenna gets its name.

High performance is realized with the TJ on 80 through 15 meters because the maximum current point is elevated above ground. On 160 meters, the performance approaches that of a full-size, $1/4$ - λ vertical antenna. The horizontal section of the TJ does not radiate appreciably. The current on each side is of equal magnitude and opposite phase, thus cancelling radiation.

The three lower frequency bands employ a combination of top loading techniques to physically shorten the antenna. The end sections act as capacitance hats on 80 and 160 meters. On those two bands there is an almost $2/3$ size reduction in the TJ. Because top loading is employed, bandwidth is not reduced as drastically as it would be if other methods were used. On 160 meters, top loading means a more desirable current distribution and a more favorable feed point impedance (30 to 40 Ω compared with 8 to 10 Ω for a base-loaded vertical). If the ground system has a resistance of 5 Ω , the TJ should be about 85% efficient on 160 meters. A base-loaded vertical would exhibit only half that efficiency. Better efficiency means more effective radiated power — exactly what we all want.

Construction Details

The loading coils are wound on 8-inch

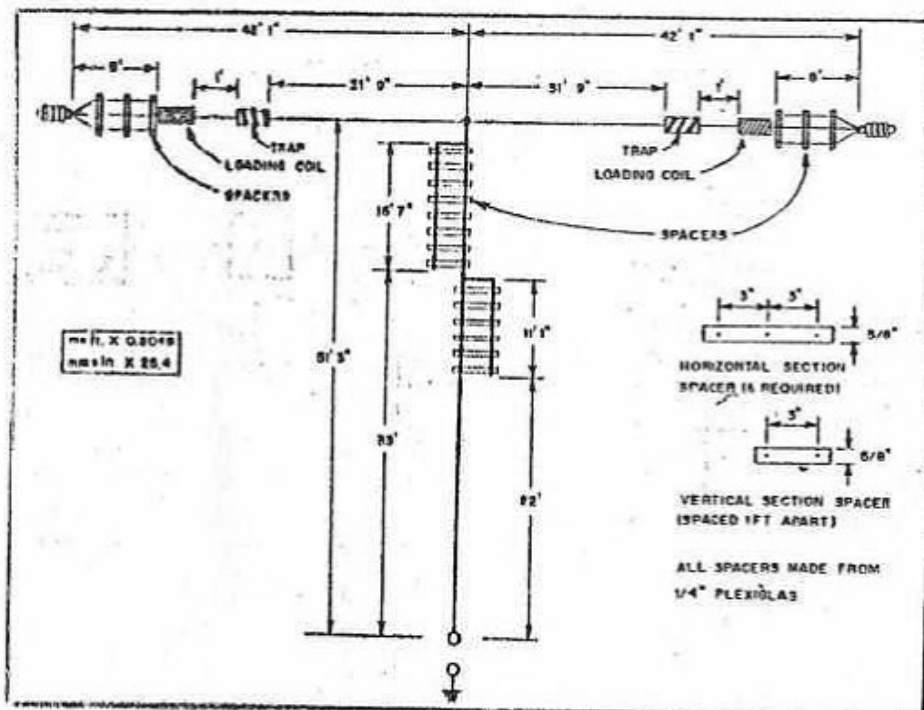


Fig 1 - The TJ antenna

lengths of 1-1/2 in. PVC tubing. Use 120 turns of close-wound, no. 14 enam. copper wire. I installed a pair of egg insulators inside each coil for support.

The 40-meter traps employ the same type of tubing and support scheme. They were constructed after a QST article by Johns. I used RG-59/U coaxial cable and found resonance at 7.05 MHz, using 11 turns.

The dimensions shown in Fig. 1 were derived empirically. You can copy the measurements or modify them for operation in your favorite parts of the bands. I find resonance in my antenna at 1.815, 3.6, 7.05, 14.1 and 21.1 MHz.

Install the TJ in the clear, as far from surrounding objects as is possible. High

quality glass or ceramic insulators should be used at the antenna ends. Nylon rope can be used to support the antenna. The feed point should be no more than 2 feet above the ground.

A good ground is required for efficient operation on 160 and 40 meters. My ground system covers 2 acres and employs a buried network of over 5000 feet of solid copper ribbon. You may not want to duplicate that, but you should install an effective ground system. Stanley described several possible configurations in QST.

Tuning the TJ

An antenna-matching network is essential to proper operation of the TJ. The network should be installed at the antenna feed point, using the shortest leads possible. Adjustments can be set for the

Table 1
Antenna Feed-Point Impedance

Band	Impedance (approx.)
160	35 Ω
80	>1000 Ω
40	100 Ω
20	>1000 Ω
15	>1000 Ω

favorite band of operation, or you can do it by remote control.^{4, 5, 6}

Feed-point impedances are given in Table 1. These impedances can be matched with the three configurations shown in Fig. 2. The exact values for these networks should be determined experimentally for each installation. Components for the matching networks should be mounted in a weatherproof housing.

Start with a quarter wavelength of coaxial cable for the 40-meter matching stub. To find the length in feet, divide 234 by the frequency in megahertz and multiply by the velocity factor of the cable. (Velocity factor is 0.66 for polyethylene dielectric and approximately 0.80 for foam.) Short the free end of the stub and observe the SWR. Now shorten the stub, short the end and check SWR. Continue this process until a satisfactory match is found. The stub can now be rolled into a coil and the end taped.

One nice feature of stub matching is bandwidth. As you move away from resonance, the reactance of the antenna and stub move in opposite directions. The

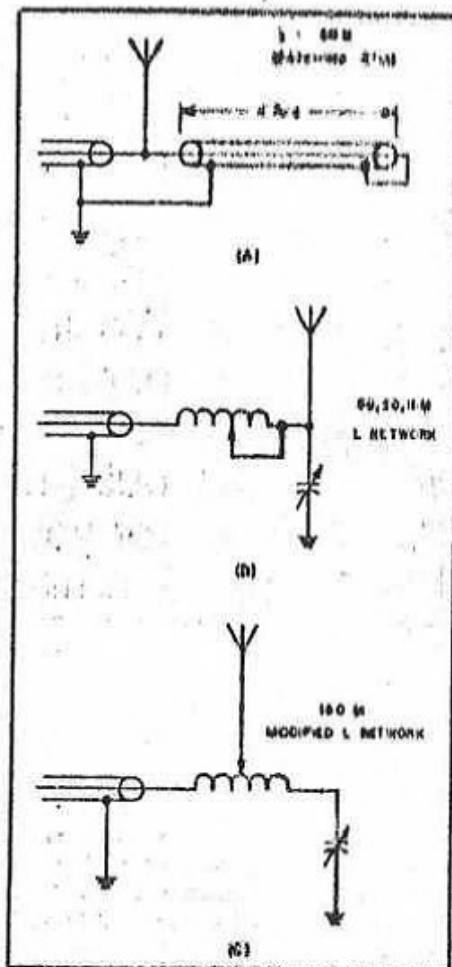


Fig. 2 -- Matching networks for the FJ. Capacitance and inductance values should be determined experimentally for each band.

reactances tend to cancel, thus providing greater bandwidth.

The matching circuit for 80, 20 and 15 meters is a simple L network. On 160 meters I employ a modified L network. I found that the best match and highest antenna current was obtained with the tap a little more than half way toward the variable capacitor. The TJ covers the entire cw portion of any of the five bands, with one setting of the antenna-matching unit.

Performance

Short-skip performance is not as effective as it is with a low horizontal antenna. Lack of high-angle radiation explains that characteristic. Ground-wave coverage is very good, thanks to vertical polarization and a low angle of radiation. Best of all, that low angle accounts for the excellent DX results I have obtained while using the TJ.

I found it satisfying and a lot of fun to build my own antenna. You would, too. Why not construct your own TJ? Good luck and good DX!

Notes

- ¹um = in. $\times$ 25.4, m = ft $\times$ 0.3048.
- ²R. H. Johns, "Coaxial Cable Antenna Traps," *QST*, May 1981, p. 15.
- ³J. O. Stanley, "Optimum Ground Systems for Vertical Antennas," *QST*, December 1976, p. 13.
- ⁴H. Drake, Jr., "A Remotely Controlled Antenna Matching Network," *QST*, January 1980, p. 32.
- ⁵D. K. Inamura, "A T-Network Semi-Automatic Antenna Tuner," *QST*, April 1980, p. 26.
- ⁶W. H. Sanford, Jr., "A Modest 45-Foot DX Vertical for 160, 80, 40 and 30 Meters," *QST*, September 1981, p. 27.

FK25A

SPECIAL PREFIX

NEW CALEDONIA

To commemorate the 25th. anniversary of the Amateur Radio Association of New Caledonia, all members of our club will use a special prefix during the period from 9th August to 31st December inclusive.

This prefix will be : **FK25**

At the same time, and for the same period, the club station will use the call sign : **FK25A**

In order to allow a maximum number of OM's around the world to qualify for this commemorative award, our members have pledged to be on air as often as possible from August through December.

Also the club station will be activated very frequently.

ARANC FK25A Committee.

Please support this award, we have had great support from FK for our club awards. VK3XEX.

OMs? Now, really!

de magicien VK3XEX

86/08 07

Throw Away Your Pencil!



Whether it be to build operating confidence, to prepare for an exam or just for personal satisfaction, most amateurs want to increase their code speed. Here's one ham's method.

By Melvin Broadus, K6LJE
573 East Fremont
Fresno, CA 93710

Do you stumble through the code bands at 14 or 15 words per minute? Does 18 WPM push you? Would you upgrade to Extra if you could crack 20 WPM? Well, you can do it if you are willing to try breaking out of the slow-code strait jacket.

Until recently, I was hard pressed to copy 18 WPM. Today I'm copying 35 WPM, cold turkey. A veteran ham showed me the way.

I'll never forget the QSO that turned me around. The earphones were tight against my ears. I grabbed another pencil. The lead smoked across the last sheet of the tablet. 18 WPM was crowding me.

"By the way, Mel..." Pete went on as I came to the end of the sheet.

The break-in was working, so I leaned on the key for a short string of dits.

"Wait one, Pete, while I get more paper."

As I rose from the chair to look for another tablet, I heard Pete's signal coming from the earphones. He was laughing.

I jerked open the cabinet, grabbed two tablets and returned to the desk. Wiping the sweat from my fingers, I touched the paddle.

"Okay now, Pete. Have paper."

"Mel," he replied. I copied my name easily. "Would you like to be able to copy faster?" I could feel the blood rush. At 18 WPM I thought I was *already* blistering the frequency. Yet after 28 years of Amateur

Radio—I was ashamed to admit—I had failed to break 20 WPM, though I had often tried.

I put down the pencil and swallowed hard. Touching the paddle gently, I sent one word: "Yes." His message came back like a shot.

"Throw away your pencil."

"What does he mean?" I wondered.

"How can I copy without the pencil?"

"Mel," Pete's signal filled my earphones, "do you copy?"

"Yes," I answered, "but I don't understand."

Again the code filled the phones: "Throw away your pencil. Now!"

My pulse quickened. He was serious! Hand shaking, heartbeat in the paddle, I tapped out, "Okay, Pete, you're asking a lot of me. But I'll try it."

I closed my eyes, put down the pencil and held my hands against the phones.

When it was all over, I walked out of the shack feeling nine feet tall.

Walking into the kitchen, I stammered to my wife and kids that their old man had chewed the rag for an hour without touching a pencil, an accomplishment I had thought impossible. My 12-year-old son was impressed.

"Gee, Dad, you can do everything!" he said. I don't know if he understood just what I had accomplished.

Twelve weeks later, heg-wild and crazy for CW, I copied 35 WPM, hands down.

I'm only embarrassed that I had not done this long ago.

Your Turn

If you are still pencil-bound and wondering how you can get started, I can give you this answer: Throw away the pencil and start listening to the signals as if it were just another way of speaking.

First, seek out strong, well-fisted signals—preferably from a keyboard—being sent at two or three words below your ceiling. (I recommend copying the keyboard signals whenever you can. When starting out, you need their precision spacing, character formation and timing.) Once you have located a signal, fasten onto it like a leech. If it helps, put your elbows on the desk and close your eyes while the dits and dahs dance in your head.

The trick is to *concentrate intently*. If you are doing it right, it'll nearly suck you dry after the first two or three hours. In four or five weeks, however, after you've developed the technique, you won't have to concentrate so hard. Believe me, it gets easier and eventually becomes second nature—just like listening to a voice.

It's hard to describe, but with constant practice you can soon learn to flash the words onto the mind's screen, so to speak. Try visualizing each letter (eyes closed) as if they were printing on your inner eyelids. Rather than slavishly writing out each character, as though engraving it in stone,

let your mind focus on each character. With practice, your mind will print it out for you.

What you'll hear in the beginning, as the really good CW ops have told us for years, are short words like *the, an, for, rig, name, watts*. You'll also begin to pick out prefixes and suffixes on longer words: *con-, pro-, -ine, -ing*. They will jump out at you.

What you're doing is training yourself to comprehend words and parts of words rather than single characters. That's the secret. The best CW operators have used this technique for years. However, this freehand method won't work on ciphers, random groups, or the like. Nor is it recommended for Novice class licensees who are still struggling with basic character recognition at very slow speeds. [A note of caution: No matter what your proficiency while copying in your head, there are times when copying on paper is the preferable method, such as when handling emergency traffic.—Ed.]

Working Up the Speed

If things are going right, by the second week your eyes may look like two burnt holes, but you'll have a new skill and be on your way to mastery of 20-WPM code. Now you are ready for some bold transmissions. I mean you must get into some ragchews. Simply copying someone else's QSO, helpful as that is, will not generate the pressure you need for fast speed gains.

On the other hand, the white-knuckle pressure of hands-free ragchewing will

Four Steps to Increasing Code Speed

- 1) Put down that pencil
- 2) Concentrate intently (your brain can take it)
- 3) Copy the best signals, especially keyboards
- 4) Ragchew, hands-free (remember to increase WPM)

drive up your speed like a rocket, as it did in my case. (If you get in over your head, you can always resort to the pencil.) But try not to use anything more than you absolutely have to—just brief notes from which to prepare replies.

When you're ready to take the plunge, pick out a keyboard "musician" sending at a speed that you estimate as three or four words below your best. Call him. As he responds, *concentrate intently* on his CW; you should be able to comprehend 60 to 70 percent of the message without writing it down. After about 20 minutes, if you haven't fainted, request a speed increase of 2 WPM; the keyboard ops will generally be happy to oblige.

If 20 WPM is close to your limit, the veins may be standing out on your neck, but keep the pressure on. The idea is to advance to a speed higher by five words or

more than your best. What I'm suggesting is, of course, strenuous; but if you work at it, in a few weeks you will exceed 20 WPM.

Be sure to explain to your contact that you are trying to increase your copy speed, or he may be annoyed if he discovers that you're not copying solidly at the speeds you requested.

I'd like to pass along a sequence that netted me a speed increase of 5 WPM in one week:

- 1) For the first 20 minutes of ragchew, copy at 3 WPM below your ceiling (you'll probably copy 60 percent).
- 2) Copy at 3 WPM *above* your ceiling for 10 minutes (you'll copy about 30 percent).
- 3) Copy at 5 WPM *above* your ceiling for 5 minutes (you'll copy about 20 percent).
- 4) Go back to starting speed for 10 minutes, then conclude chat.
- 5) Repeat steps 1-4 three times daily (or more) for one week, for 21 hands-free ragchews in one week.

If that works for you as well as it worked for me, in seven days your copy speed will increase by 5 WPM or more.

Personal Satisfaction

Those who learn to copy in their heads are likely to get a lot of satisfaction from it, just as I did. Racing along at 30 WPM or more while taking the Morse in the brain is exhilarating. I found it—pardon the expression—to be a heady experience. EET

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EVERYTHING FROM A TO Z IN ELECTRONICS

An End-Fed Extended Double Zepp for 2 Meters

Add a bit of "Zepp" to your 2-meter signal. Build this inexpensive gain antenna that'll provide the coverage you need.

By Jim McDonald,* WBØJQH

The Zepp, double Zepp and extended double Zepp have been a part of the amateur's antenna repertoire for many years. The extended double Zepp offers some advantages over other antennas of simple construction, such as the dipole or ground plane vertical. It has approximately 3 dB of gain over a half-wavelength dipole¹ when center or stub fed,² is easy to feed with common transmission lines and is fairly broadband. An extended double Zepp is composed of two approximate $5/8$ wavelength elements driven (usually) through a phasing section. The antenna exhibits gain over a half-wavelength dipole because of the addition of another element and the greater current-lobe spacing than would occur in a one-wavelength dipole (Fig. 1). In practical use, the conventional construction method has some disadvantages: no dc ground, and transmission line interaction with the lower radiating element, when the antenna is polarized vertically.

The end-fed version described here eliminates these problems. This feed method (Fig. 2) lends itself nicely to vertical operation. The transmission line is tapped along a shorted quarter wavelength matching section, or J-feed. This permits antenna and transmission line impedance matching and removes the feed line from the radiating plane. It also provides a dc grounding point for lightning protection.

The "Why"

This antenna was designed for accessing

2-meter repeaters in a 60-mile² radius, and occasionally a distant one about 100 miles away. These repeaters are scattered along the Front Range of the Rocky Mountains from above the Wyoming/Colorado border to south of Colorado Springs. No coverage to the east, the open plains, was needed. To obtain this pattern, I decided to ensure a little gain by properly spacing the antenna alongside the tower, using the tower as a reflector.

Construction

Assembling an antenna of this type is

simple and inexpensive. Construction details are provided in Figs. 3, 4 and 5. Aluminum tubing or EMT (electrical metallic tubing) can be used. Check your local building supply store or junkyard for economical antenna materials.

A PVC center insulator is satisfactory with transmitter power inputs of up to 100 watts. If high power operation is anticipated, a better insulating material, such as Plexiglas, Lucite or ceramic should be substituted.

The completed antenna is spaced 16.25 inches (about 0.2 wavelength) from the

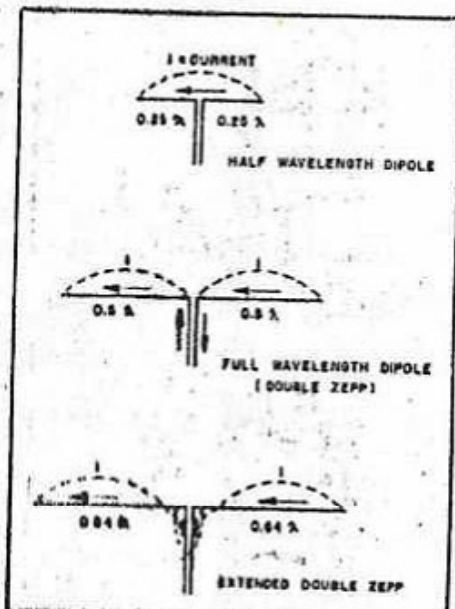


Fig. 1 — Current distribution for the various antennas discussed in the text.

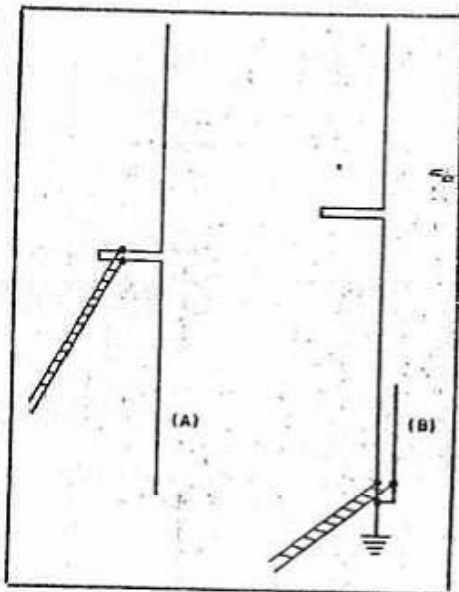


Fig. 2 — At A, the conventional arrangement for feeding the extended double Zepp. The end-fed or J-fed method is shown at B.

*Notes appear on page 38
*P.O. Box 251, East Derry, NH 03041

tower on two brackets. These brackets are made of the same materials used for the antenna. The upper bracket has PVC tubing as an insulating sleeve and attaches to the upper element about 20 inches above the center. The lower bracket has no insulator and provides the dc ground through contact with the tower leg. Mounting details are shown in Fig. 6.

Feed Methods

I have used two methods of coupling the coaxial feed line to the quarter wavelength matching section: direct, unbalanced, coaxial feed, and balanced input using a bazooka or 1:1 coaxial balun.¹ There seems to be little difference in the performance of the antenna with either feed method, although the balanced input seems to "feel good" to me. Another amateur in the area has reported success using a 4:1 coaxial balun.

An SWR indicator is inserted in the feed line and observed while the transmission line is moved along the matching section rods. When the best match is obtained, the line is permanently attached to the rods with sheet-metal screws or compression clamps. In my installation these points are between 4 and 4.5 inches above the shorting strap at the end of the section. If the 4:1 balun is used, these dimensions will probably vary.

How Well Does It Work?

Now that the antenna is up, how does it fare against the competition? A wire version of this antenna was built and compared to a vertically polarized half-wave dipole. The antennas were connected to an antenna switch through equal lengths of RG-58/U coaxial cable. An rf step attenuator, similar to those described in *The Radio Amateur's Handbook*,² was inserted in the transmission line from the extended double Zepp. Signals were monitored using a 2-meter transceiver while I switched between the antennas. The attenuator was adjusted until the extended double Zepp showed the same S-meter reading as the dipole. With the Zepp in the clear (using no reflector) it showed approximately 3 dB gain over the dipole. This would correspond roughly to 4.5 dB over a ground plane. A slight reduction from the 3-dB figure was expected because of the end-fed system causing slight differences in the magnitude of the currents in the two radiating elements, but none was detected with the equipment used. When mounted on a mast and spaced 0.2 wavelength from it, the wire antenna showed the expected cardioid pattern and an additional 1 to 1.5 dB forward gain.

This antenna has proven to be quite effective. The desired repeaters can be accessed and good signal reports are received. Simplex operation is improved dramatically compared with similar operations using a J-pole antenna at the

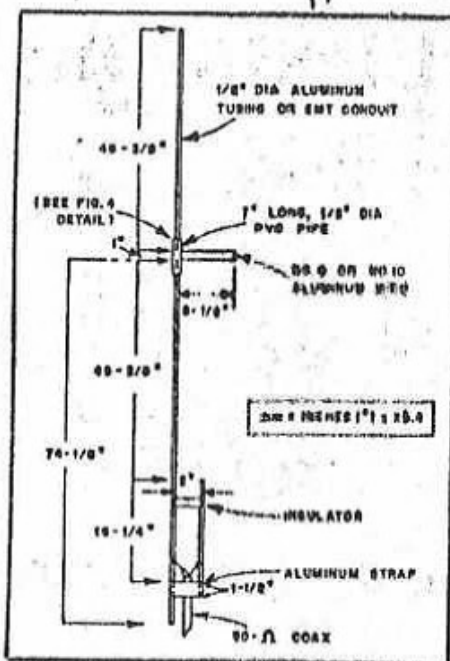


Fig. 3 — Construction of the end-fed extended double Zepp for 2 meters.

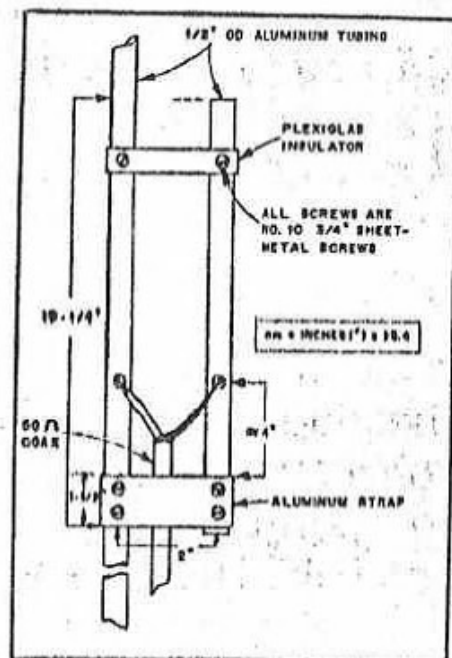


Fig. 4 — Quarter-wave matching section details.

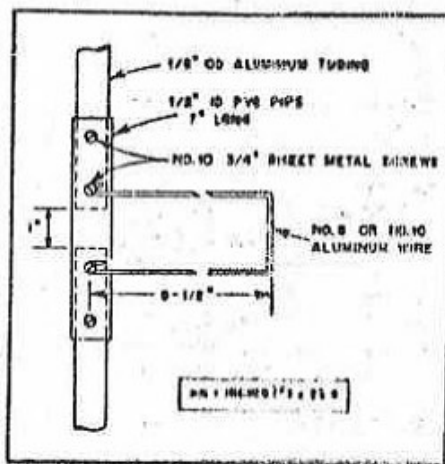


Fig. 4 — Center phasing section construction details.

same height. Try the extended double Zepp. An antenna design that is almost as old as Amateur Radio itself, it's inexpensive and performs well.

Notes

¹The ARRL Antenna Book, twelfth edition (Newington: American Radio Relay League, 1970), p. 141.

²W. Orr, *The Radio Handbook*, twenty-first edition (Indianapolis: Editors and Engineers, 1978), p. 25.11.

³The Radio Amateur's VHF Manual (Newington: American Radio Relay League, 1985), p. 173.

⁴km = mi. x 1.609, mm = in. x 25.4

⁵See note 1.

⁶The Radio Amateur's Handbook, fifty-eighth edition (Newington: American Radio Relay League, 1981), p. 15-38.

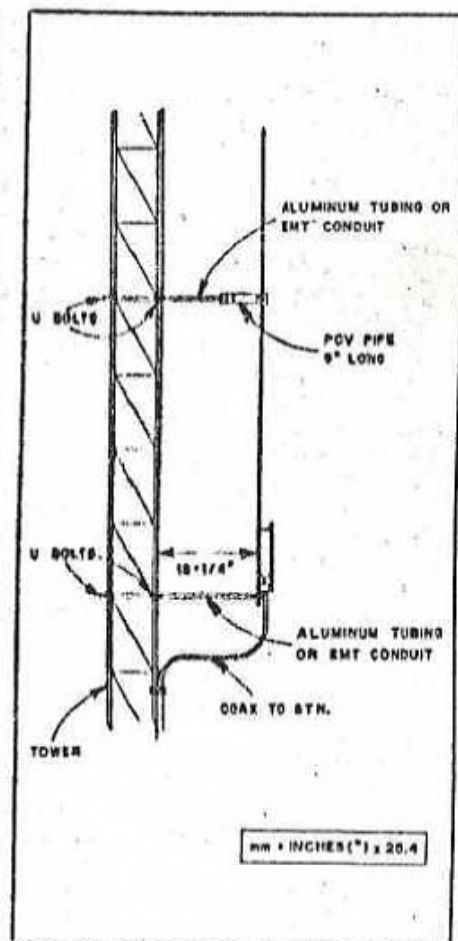


Fig. 6 — The method used in securing the extended double Zepp to the side of a tower. A section of PVC pipe is used to insulate the upper support from the antenna proper. The lower support provides a dc ground for the antenna (through the tower).

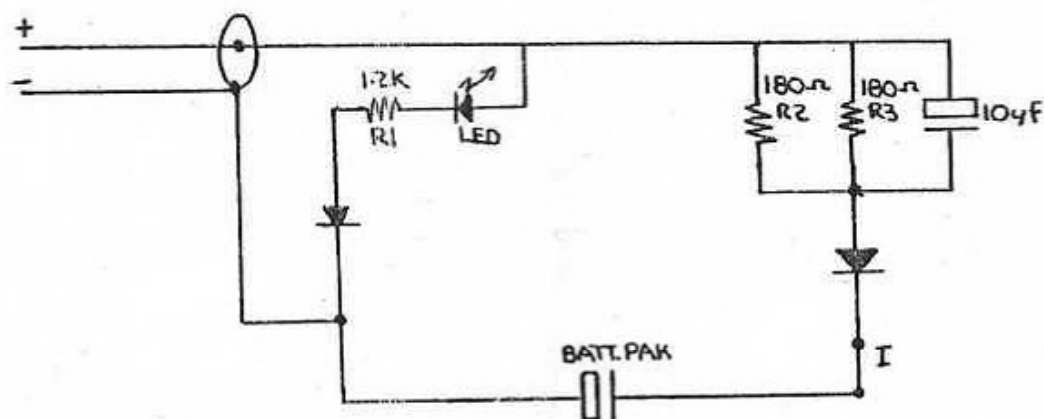
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TECH TIP

IC-BP3 1com2A Batt. Pack

In standard form 40mA flows through the batteries.
Change R2&R3 to 390 Ω 1/4W. This limits current to 25mA.

* Note mod is ok if standard BC 25E wall charger is used. Actual charging current may have to be checked if different charger is used.



Cheers Dick VK3AEX

OFF FREQUENCY

Bud VK3NFZ

At the end of July, Bud underwent major surgery for a gallbladder condition. The operation was a success. I visited Bud at home and expected to see him sitting quietly in a sunny spot. Instead, he was studying cw and was as talkative as usual. In a mere ten minutes, Bud had shown me his logkeeping system, his homebrew quad, his rotator, his map that lights up when the mast is rotated, and his --- you guessed it --- scar.

Thanks, Bud. It was a magnificent visit. Get well soon and we all hope to see you at the August meeting.

de Maggie VK3CFI

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Introducing Japanese Amateur Satellite Number One (JAS-1)

In nature, a sign of a healthy, prosperous species is often proliferation. It's true in Amateur Radio satellites as well. The latest to appear on the scene is JAS-1. The specifications below were provided by Tak Okamoto, N6MBM/JE2PKI, and Harold Price, NK6K.

JAS-1 is a joint effort of many organizations. Besides JARI (Japan Amateur Radio League) and NASDA (Japanese national space agency), the Nippon Electric Company (NEC) built "system" units (space frame, power supply etc). JAMSAT (Japan AMSAT) designed and built the "mission" units (transponders, telemetry/command and housekeeping microcomputer) and ground-support systems.

JAS-1 Mission Objectives:

- Provide reliable worldwide Amateur Radio communications.
- Enable radio amateurs to study tracking and command techniques.
- Offer an in-space "proving ground" for radio amateur developed and built transponders and subsystems.
- Provide NASDA an opportunity to carry out a "multipayload" launch using their new "H-1" launcher. (NASDA has never engaged in a multipayload launch, thus the JAS-1 project will offer NASDA an excellent opportunity by providing them with an active payload having its own telemetry-beacon and transponder for ranging.)

Form and General Dimensions: The spacecraft is a 26-facet polyhedron, which measures 400 mm x 400 mm x 470 mm (15.75 in x 15.75 in x 18.5 in) and weighs 50 kg (110.2 lbs).

Launch and Orbit: JAS-1 will be launched into a circular low-earth orbit, which will be non-sun synchronous and non-polar.

Launch vehicle: H-1 2-stage rocket

Launch number: Test Flight 1

Launch site: Tanegashima Island, Japan

Launch date: August 1986

Estimated inclination: 50 degrees

Estimated altitude: 1500 km

Estimated period: 120 minutes

Estimated window per pass: 20 minutes/pass

Estimated passes per day: 8 passes/day

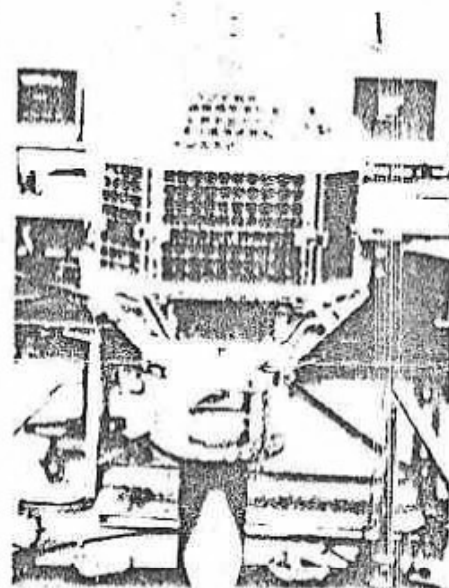
Designed Life: Estimated lifetime is three years.

Special Features of JAS-1: JAS-1 will carry two separate Mode J (2-meter uplink, 70-cm downlink) transponders. One is a linear transponder, and the other is a digital "store-and-forward" transponder mainly for non-real-time communication between stations located in different time zones. The digital transponder will provide "error-free" information exchange.

Transponders:

a) The linear transponder: Mode JA

The passband is 100 kHz wide. The transponder has an output of 1-W PEP. Ground stations will need an uplink power of 100-W EIRP. The sidebands are reversed, i.e., the uplink is LSB and the downlink is USB. There



is a 100-mW CW beacon switchable to PSK when needed.

Uplink passband: 145.90 MHz-146.00 MHz.

Downlink passband: 435.80 MHz-435.90 MHz.

Beacon frequency: 435.795 MHz.

Translate frequency: 581.80 MHz.

b) The digital transponder: Mode JD.

There are four 145-MHz-band input channels using Manchester-coded FM for the uplink. Ground stations will need 100-W EIRP. There is one downlink channel in the 435-MHz band using PSK; the output is 1-W RMS.

Channels are:

Uplink channel 1: 145.850 MHz.

Uplink channel 2: 145.870 MHz.

Uplink channel 3: 145.890 MHz.

Uplink channel 4: 145.910 MHz.

Downlink channel: 435.910 MHz.

The data format is HDLC. The protocol is AX.25 Level 2 Version 2. The data transfer rate is 1200 bit/s for both uplink and downlink.

JAS-1 will be a store-and-forward system but not a real-time digipeater. Digipeating is ineffective in low orbit.

JAS-1 has four uplink channels for one downlink channel. This is attributable to the differences in channel efficiency between uplink and downlink. An uplink channel will be shared by several ground users. Since the ground users won't hear each other, the uplinks will be subject to packet collisions. This "Pure ALOHA" system has maximum channel throughput of 18.4%. But the JAS-1 downlink will be 100% efficient since only JAS-1 transmits there. To balance capacity and add redundancy, four uplink channels are used. The combined uplink efficiency will

then be $4 \times 18.4\%$ or 73.6%. The remaining downlink time will be used for general messages and telemetry data.

Digital Hardware: The microprocessor is a MIL-STD-883B screened NSC-800. It controls the digital transponder and is the IHU (Integrated Housekeeping Unit). The memory is 1.5 megabyte (Mbyte). Forty-eight 256-kbyte NMOS DRAMs are used. A hardware-based error-detection/correction circuit is incorporated to protect the entire 1.5 Mbyte and provide a 1-Mbyte error-free memory area. The system program occupies some 32 kbytes. The rest will be used for message storage.

The memory unit is physically divided into four identical 256-kbyte memory cards, any one of which can be assigned as the system area. Up to three cards can be turned off. This design provides system redundancy and allows command stations to control power consumption without a total loss of service.

JAS-1 has five hardware HDLC controllers: Four of them are for the uplink channels and one is for the downlink channel.

Power System: Twenty-five of JAS-1's 26 faces are covered with a total of 979 solar cells and will initially generate 8.5 W. JAS-1 employs 11 NiCd battery cells with a capacity of 6 Ah. These supply an average 14 V to the JAS-1 main power bus. The 14 V is converted and regulated to +10 V, +5 V and -5 V.

Antenna System: JAS-1 has three antennas, 2-m receive antenna: slant $\frac{1}{4}$ -wave monopole; isotropic; -4 dBi gain 70-cm transmission antenna.

Mode-JA: slant turnstile LHCP +Z axis +3 dBi gain.

Mode-JD: slant turnstile RHCP -Z axis +3 dBi gain.

Attitude Control: Forced shaking using the earth's geomagnetic field. JAS-1 has two 1 TAm² permanent magnets in its Z axis.

Telemetry: The analog system telemetry has 12 analog channels and 33 system status flags. The telemetry is sent on the 100-mW beacon on 435.795 MHz in CW, switchable to PSK.

The digital system telemetry has 29 analog channels and 33 system status flags. This software-driven telemetry can be sent in any format and can include short text messages. This telemetry can be sent on either the Mode JD downlink channel (435.910 MHz) or the Mode JA CW beacon (435.795 MHz).

Command: A simple three-channel telecommand system is used for global control functions. An additional 37 channels are available, mainly for controlling the digital transponder. On-board command from the NSC-800 is also available.

Ground Stations:

Mode-JA: A station with a 10-W 2-m SSB transmitter and a 10-dBi beam for uplink will

OSCAR 8 Packet Radio Breakthrough

Tom Clark, W3IWI, says he's become the first to receive packets bounced off the moon (OSCAR 8). Tom is currently in Fairbanks, Alaska on a temporary assignment for NASA where he is doing radio-astronomy work. He has occasional access to a 65 foot dish antenna and recently put it to use on 432 MHz. With 100 watts he was able to copy his own packets very well after the round trip to the moon. But when trying to connect with Dave, KE1TU, using a 20 foot dish, success eluded the pair. Given some time to work out the hitches, Tom and Dave are certain they can connect via packet via OSCAR 8!

WANTED

General coverage receiver.

Des Heenan
12 Simpson St.
Ballarat

PH. 326421

A 40-Meter Quad, the EZ Way†

Are you a "little pistol" on 40? Hankering to compete with the "big guns"? This quad may be the answer. Build it for less than \$20!

By Anthony W. (Tony) DePrato,* WA4JQS

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When I decided to try my hand at 40-meter DXing, I soon found that the inverted-V antenna just did not compete. Using a kilowatt amplifier, I could do a fair job of holding my own, until I found myself in a pile-up with the "big guns."

Enter the Quad

What I needed was an antenna with gain and directivity, but it had to be inexpensive and present low wind loading. A standard Yagi beam was out of the question! I decided on a fixed-direction quad. Since I have two towers, on the east and west end of my lot, I chose to string the quad between these supports.

My first try was a driven element only. In addition to improving the signal to the north and south, it decreased the QRM from European broadcast stations. Even though I was impressed with the results, I wanted something better. I wanted to add a reflector element, but I had trouble imagining how to do it, since I had only two supports.

Then I had an inspiration! Since the 1/8-wavelength element spacing of a 40-meter quad is approximately 17 feet, why not use horizontally mounted lengths of wood two-by-fours? Shortly thereafter, I made a trip to the lumber yard and procured two 20-ft-long two-by-fours.

Construction

My design is shown in Fig. 1. The

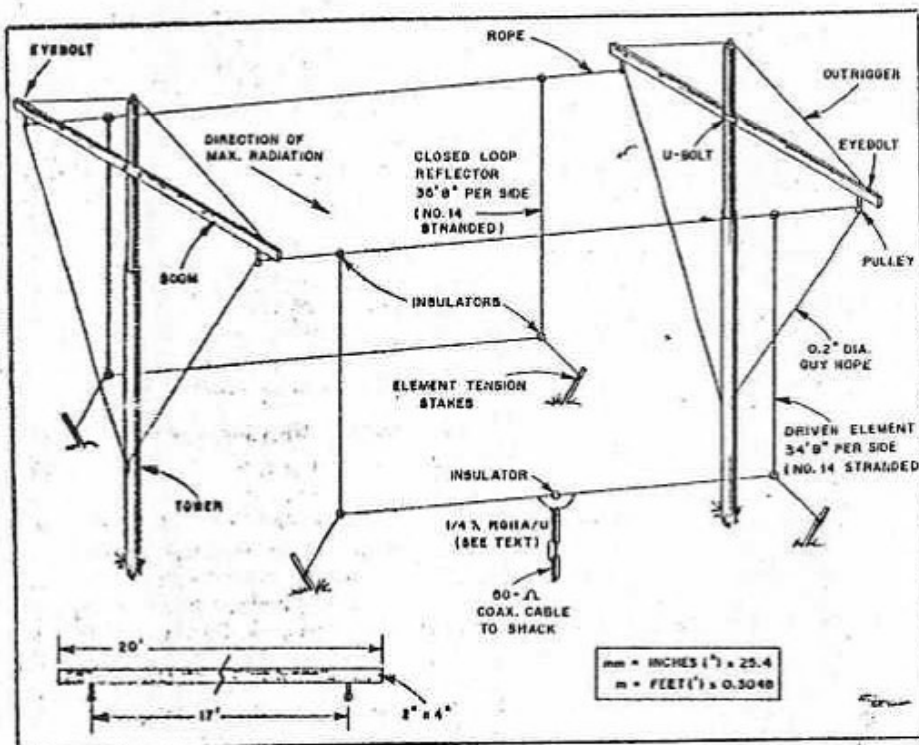


Fig. 1 — Construction details for the 40-meter quad. The quad could be erected in a diamond configuration, but this would require some structural alterations.

length of the driven element can be found with the formula

$$L = \frac{1005}{f} \quad (\text{Eq. 1})$$

where L is the length in feet, and f is the frequency in MHz. The reflector should be cut approximately 5% longer. For

resonance at 7.2 MHz, the length of the driven element is 139 feet, 5 inches, or 34 feet, 8 inches, per side.

After cutting the wire for the driven element and reflector, I installed four insulators on the reflector so that each side was of equal length (35 feet, 8 inches). I used five insulators on the driven element — one at each corner and a fifth one at the feed point.

*m = feet x 0.3048; mm = inches x 25.4.

†Adapted from an article of the same title appearing in September 1981 *Radio ZS* (South African Radio League).

*205 Cherokee Tr., Somerset, KY 42601

Before mounting the two-by-fours to the tower with U bolts, I drilled holes 17 feet apart in each. After installing eye bolts with pulleys in each hole, I weather-proofed the wood with spar varnish. With an adequate supply of rope in each pulley, I hoisted the two-by-fours to the tops of the towers and attached them with U bolts. The outrigger system, which had been attached previously to the wood with eye bolts, was then secured and pulled taut. Finally, I raised the elements into place and tied off the bottom insulators with rope to stakes.

The feed-point impedance of a 2-element quad will vary somewhat with element spacing, but will usually be in the vicinity of 100 ohms, so the mismatch to 75-ohm coaxial cable should not be prohibitive. The impedance can be matched more closely by means of a gamma-

matching section or, more simply, by using a quarter-wavelength transformer. For a feed-line impedance of 50 ohms, this transformer may consist of a section of RG-11/U (75 ohms) cut to the formula

$$L = \frac{246 V}{f} \quad (\text{Eq. 2})$$

where

L = length in feet of the matching section,

V = velocity factor of the cable used as the transformer, and

f = frequency in MHz

Using coaxial cable with a velocity factor of 0.66, the length of the matching section for my quad is 22 feet, 5-1/2 inches.

After I had installed the antenna and

pruned it while using a noise bridge, I conducted SWR and bandwidth checks. Running full legal amateur power, I had 1 watt of reflected power at 7.200 MHz and less than 3-watts reflected at the band edges. Nice! On-the-air tests have proven that the antenna performs excellently. The quad is fixed to the south-southwest; my reports from VK and ZL stations have consistently been S9 plus. I've received S9-plus-40-dB reports from Antarctica and S9 from Japan (long path). Can you beat that for less than \$20? QST

References

- Hall, J., ed., *The ARRL Antenna Book*, 13th ed. (Newington, CT: ARRL, 1978).
 Orr, W., *Radio Handbook*, 21st ed. (Indianapolis, IN: Editors and Engineers, 1978), p. 29-12.
 Orr, W. and B. Cowan, *All About Cubical Quad Antennas*, seventh printing (Wilton, CT: Radio Publications, Inc.).

JAS1 CONT.

suffice. A 70-cm receiver (with low NF) with a 15-dBi beam for downlink should be adequate.

Mode-JD: In addition to the Mode-JA setup, FM mode will be required for the 2-m transmitter.

Since JAS-1 uses the standard AX.25 protocol and 1200-bit/s data rate, ground stations will be able to use a TAPR-style TNC, a 2-m FM transmitter and a 70-cm receiver without modification.

The JAS-1 modem and a special interface board will be made available. [Additional in-

formation and a schematic diagram of the JAS-1 modem circuit appear in the *5th Computer Networking Conference* publication (see "Outline of Satellite JAS-1" by Fujio Yamashita, JS1UKR). See page 140, this issue, for ordering information. Ed.] It will contain the Manchester modulator and an audio PSK demodulator, allowing connection to the "modem disconnect" connector of a TAPR-style TNC. The modem also connects to the audio input and PTT of the 2-m FM transmitter and to the audio output and frequency control (option) of a 70-cm SSB receiver. Although JAS-1 will be available to individual access, the general amateur community will benefit from "JAS-1 gateways." Messages relayed through gateways can be sent worldwide and will be as easy as sending messages to distant stations via a WOLFF III gateway.

Watch for word on the launch of JAS-1 this August on AMSAT nets and on ARRL bulletins from WIAW.^{1,2}

Notes

- ¹A list of active AMSAT nets is available from the author for a business-sized SASE.
²Information about getting started on OSCAR, the AMSAT Software Exchange and AMSAT membership can be obtained for a business-sized SASE to the author.
³Help in getting on OSCAR may be as close as your nearest AMSAT Area Coordinator. For his name and location, call Jack Somers, WA6VGS, at 800-421-6621. QST

AMSAT Net- 3.685 MHz
 Sunday 1000UTC (2000 local)

Packet Net- 147.575
 Tuesday 0930UTC (1930 local)

Nir has been heard on the following frequencies:-
 143.625; 121.750; 142.400; 142.417; 142.600; 143.144;
 143.835; 166.000; 192.040; 144.134; 143.825; 141.750.
 If you hear noise on those frequencies, it means that data is being downloaded via spread spectrum techniques.

This issue of the magazine contains much information from QST, hopefully it will be of value to members.

RON VK3XOA
 EDITOR

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